

## Claims

1. A process for producing hydrogen from bio-oxidisable material by:
  - introducing the bio-oxidisable material into a reactor provided with an anode and a cathode and containing anodophilic bacteria in an aqueous medium;
  - applying a potential between the anode and cathode of between 0.05 and 1.5 volt;
  - collecting hydrogen gas from the cathode.
2. A process according to claim 1, in which the potential between the anode and cathode is between 0.2 and 0.7 volt.
3. A process according to claim 1 or 2, in which a pH of between 3 and 9, preferably between 5 and 8, is maintained in the aqueous medium.
4. A process according to any one of claims 1-3, in which the anodophilic bacteria are derived from activated sludge and/or anaerobic sludge.
5. A process according to any one of claims 1-4, in which the anodophilic bacteria are replaced by or supplemented with non-anodophilic bacteria, and an electron mediator is present in the reactor.
6. A process according to any one of claims 1-5, in which, in a stage subsequent to the hydrogen production stage, electric power is produced by interrupting the application of the potential and passing oxygen to the cathode.
7. A process according to claim 6, in which the duration of the hydrogen production stages and the power production stages have a ratio of between 1:4 and 4:1.
8. A process according to any one of claims 1-7, in which pure carbon dioxide gas is collected at the anode.
9. A reactor suitable for carrying out the process according to any one of claims 1-8, comprising a reactor cell containing an anode in an anodic compartment and a cathode in a cathodic compartment optionally separated by a proton-permeable membrane, a liquid inlet and one or two, optionally closable, liquid outlets, a gas inlet and optionally a second closable gas inlet, a gas outlet connected to the anodic compartment and a gas outlet connected to the cathodic compartment, a DC power supply and optionally a power consuming device.